

**IN THE UNITED STATES PATENT & TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Group Art Unit: 1723  
Examiner K. S. Menon

Application of:	Wolfgang SCHNEIDER, et al.
Serial No. :	09/986,446
Filing Date :	November 8, 2001
Entitled :	DEVICE FOR FILTERING AND ADDING GRAIN REFINING AGENT TO METAL MELTS

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Signature	Date

**BRIEF ON APPEAL**

Sir:

Appellants submit the following Brief on Appeal in connection with the above-identified patent application.

**I. REAL PARTY IN INTEREST**

The real party in interest in the above application is the assignee, Hydro Aluminum Deutschland GmbH of Germany.

**II. RELATED APPEALS AND INTERFERENCES**

There are no other appeals or interferences known to appellants, the appellants' legal representative, or the assignee which will directly affect or be directly affected by or have a bearing on, the Board's decision in the pending Appeal.

**III. STATUS OF CLAIMS**

Claims 1-24 have been presented for examination.

Claims 1-11, 13, and 19-20 have been cancelled.

Claims 12-18 and 21-24 were rejected in a final Office Action dated May 14, 2004. Subsequently, claim 13 was cancelled. Thus, claims 12, 14-18, and 21-24 are pending. This appeal is from the final rejection of claims 12, 14-18, and 21-24.

**IV. STATUS OF AMENDMENTS**

An Amendment Under 37 C.F.R. §1.116(b) was filed on or about October 6, 2004, wherein claim 13 was cancelled and claims 12 and 24 were amended. Pursuant to an Advisory Action dated November 4, 2004, this Amendment was entered, but did not result in the allowance of claims 12, 14-18, and 21-24.

A Second Amendment Under 37 C.F.R. §1.116(b) is being filed concurrently herewith. The purpose of this Second Amendment Under 37 C.F.R. §1.116(b) is to correct certain informalities in claims 21-23 which were not raised in the final Office Action of May 14, 2004, or the Advisory Action of November 4, 2004.

**V. SUMMARY OF THE INVENTION**

The invention is for a device for filtering and adding a grain-refining material to a metal melt. Referring to the Figure, the device consists of a lower outer frame 1 and an upper outer frame 2 which are lined with thermally resistant linings 3 and 4, respectively. A first filter chamber 5 has a ceramic foam plate 11 therein which acts as a filter. A second filter chamber 7 has a grid 15 which supports a loose-fill bed filter 16. Between the first filter chamber 5 and the second filter chamber 7 is an additional chamber 6 in which various grain refining materials are added in the form of wire 12 to the melt through the feed opening 13. The direction of flow of the melt is through the inlet 8 into the first filter chamber 5 (wherein the metal melt is filtered by the ceramic foam filter 11), into the additional chamber 6 (wherein the grain refining materials are added in the form of wire 12), through the third filter chamber 7 (wherein the metal melt is filtered by the loose-fill bed filter 16), and out through the outlet 9.

**VI. ISSUES**

The issues on appeal are:

- (1) whether the Examiner's rejection of claims 12 and 21-24 under 35 U.S.C. 103(a) as being unpatentable over JP 07/207,357 (hereinafter "JP '357") in view of US 4,790,873 (Gesing et al., hereinafter "US '873") should be reversed;
- (2) whether the Examiner's rejection of claims 14-17 and 22-23 under 35 U.S.C. 103(a) as being unpatentable over JP '357 in view of US '870, and further in view of US 4,113,241 (Dore, hereinafter "US '241") should be reversed;

(3) whether the Examiner's rejection of claims 18 and 22-23 under 35 U.S.C. 103(a) as being unpatentable over JP '357 in view of US '870, and further in view of US 4,834,876 (Walker, hereinafter "US '876") should be reversed.

## **VII. GROUPING OF CLAIMS**

All of the claims stand and fall together.

## **VIII. ARGUMENT**

In the final Office Action dated May 14, 2004, the Examiner rejected independent claims 12 and 24 under 35 U.S.C. 103(a) as being unpatentable over JP '357 (JP '357) in view of US '873. This was reiterated in the Advisory Action of Nov. 4, 2004. According to the Examiner, JP '357 teaches a device for filtering and adding a grain refining material to a metal melt, the device comprising a first filter, a grain refining material feed downstream of the first filter, and a second filter downstream of the first filter. Although the Examiner acknowledged that JP '357 does not teach that the second filter is a deep-bed filter, as required by claims 12 and 24, the Examiner relied on US '873 as teaching such a filter. According to the Examiner, it would be obvious to one of ordinary skill in the art to modify the device of JP '357 so as to use a deep-bed filter as the second filter because "it would trap and hold metal wettable inclusions, in-line treatment, and for continuous operation." See the final Office Action dated May 14, 2004, at p. 2.

With all due respect to the Examiner, he has engaged in an impermissible hindsight reconstruction of the claimed invention. For the following reasons, a person of

ordinary skill in the art would not have modified the teachings of JP '357 in light of US '873 without the benefit of hindsight.

According to claims 12 and 24, the first filter is a porous filter which operates on the basis of cake filtration, i.e., a cake filter. Furthermore, the first filter, that is the cake filter, is specifically arranged before the grain refining material feed. This choice of filter and its arrangement before the grain refining material feed have the advantage that the efficiency of the filter is much higher compared to an arrangement in which a cake filter is arranged downstream of the grain refining material feed, because in such case, the grain refining material would hamper operation of the cake filter. Therefore, an improvement in the efficiency of the claimed filter device is provided by the special and very effective arrangement of locating a cake filter before the grain refining material feed. This particular arrangement specified in claims 12 and 24 and the attendant advantages are nowhere disclosed or suggested in JP '357 or US '873.

Furthermore, claims 12 and 24 also specify that the second filter is a deep-bed filter located downstream of the grain refining material. A deep-bed filter is inherently a very effective filter and is not taught at all in JP '357.

Moreover, it would not have been obvious to a person of ordinary skill in the art to incorporate the teachings of US '873 into the teaching of JP '357 because US '873 describes a totally different arrangement. According to US '873, a metal melt is filtered by a first and a second filter, the melt comprising even before entering the first filter both metal-non-wettable and metal-wettable inclusions. See, e.g., col. 7, lines 25-39, and

claim 1. Metal-wettable inclusions are impurities that arise from feeding the grain refining materials to the metal melt. However, according to the teachings of the present application, these impurities or inclusions should not reach the first filter, because this would reduce the efficiency of the first filter. See paras. [0009] and [0010] of the present application. Furthermore, according to the present application, all other impurities or inclusions including the metal-non-wettable inclusions should not reach the second filter, but should already be removed from the melt by a first filter, prior to the grain refining material feed. See para. [0015].

In contrast thereto, US '873 teaches that even before the first filter, there exist metal-wettable inclusions in the metal melt and therefore these metal-wettable inclusions will reach the first filter. US '873 discloses a deep-bed filter which removes inclusions from a metal melt in two steps. In the first step, the filter retains metal-non-wettable inclusions caused by oxide particles. In the second step, the filter retains metal-wettable inclusions arising from grain-refiners, e.g.,  $\text{TiB}_2$ . See, col. 2, lines 30-34 and 46-48, of US '873. Furthermore, US '873 discloses that adding borides as grain-refiners leads to impurities in the form of clusters up to 30 microns in size. See col. 2, lines 46-56. Additionally, all inclusions or impurities, that is metal-wettable and metal-non-wettable inclusions, are filtered by the second filter. It would not have been obvious to a person skilled in the art to modify JP '357 in view of US '873 because of the totally different arrangement of the filters described in US '873 in comparison to the filter arrangement of JP '357. It is only the inventors herein who discovered the special benefits that arise

from the particular kinds of filters and their arrangement relative to the grain refining material feed that are set forth in claims 12 and 24.

Furthermore, the use of a deep-bed filter as the second filter is also unobvious because US '873 describes an arrangement wherein a molten salt layer creates salt droplets before the deep-bed filter. See cols. 7-8 of US '873. The metal-non-wettable inclusions are retained by the salt droplets. See col. 7, lines 29-30. These salt droplets are then directed into the deep-bed filter, which filter according to US '873 on the one hand removes the salt droplets from the melt, and on the other hand removes the metal-wettable inclusions which arise from feeding grain refining material. In other words, US '873 teaches that the deep-bed filter only removes the metal-wettable inclusions in an effective way when at the same time salt droplets accumulate on the surface of the filter, which salt droplets are created by a salt bath located before the deep-bed filter. However, a salt bath located before the second filter is not taught or suggested by JP '357 and is not a feature of claims 12 and 24. Therefore, without the benefit of hindsight, a person of ordinary skill in the art would not be inclined to use the deep-bed filter of US '873 as the second filter of JP '357, thereby arriving at the claimed invention.

Finally, JP '357 teaches that the second filter usually clogs very fast. Specifically, according to the English translation of JP '357 (of record herein), at para. [0013], adding grain refining material leads to an accelerated clogging of the second filter due to the formation of coarse Al-Ti and Al-Ti-B impurities of the grain refining material. These coarse impurities as well as oxide inclusions enhance clogging of the second filter by

forming a tenacious filter cake. JP '357, at para. [0013]. That is why JP '357 discloses only cheap plate-filters are used as the second filters rather than more expensive deep-bed filters. JP '357, at para. [0016] and at claim 4. However, due to the special arrangement of filters recited in claims 12 and 24, the second filter does not clog very fast. Thus, due to the first filter being a cake filter, only marginal impurities or inclusions have to be removed by the second filter, these marginal impurities coming from feeding the grain refining material into the melt after the first filter. The other impurities have already been removed by the first filter in the form of a cake filter.

As a result, a device for filtering and adding a grain-refining material to a metal melt with the features of claims 12 and 24 is not obvious from a combination of JP '357 and US '873.

As all other claims in the application are dependent claims, they too are not obvious over the prior art for reasons similar to those given above.



**IX. CONCLUSION**

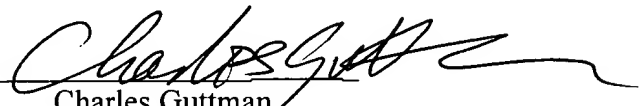
For the reasons stated above, it is requested that the Examiner's rejection of all pending claims under 35 U.S.C. 103(a) should be reversed.

Respectfully submitted,

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Date: February 11, 2005

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**APPENDIX OF CLAIMS ON APPEAL**

Claim 12. A device for filtering and adding a grain-refining material to a metal melt, said device having a flow direction for said melt, said device comprising:

a first filter comprising a porous filter medium;

a grain refining material feed, said feed disposed downstream from said first filter in said flow direction; and

a second filter, said second filter disposed downstream from said feed in said flow direction,

wherein said second filter comprises a porous filter medium in the form of a deep-bed filter,

wherein said first filter is configured to operate based on cake filtration.

Claim 14. A device according to claim 12 wherein said first filter comprises a ceramic foam plate.

Claim 15. A device according to claim 14 wherein said ceramic foam plate has a thickness of 5 to 33 mm.

Claim 16. A device according to claim 14 wherein said ceramic foam plate has a thickness of 10 to 15 mm.

Claim 17. A device according to claim 12 wherein said first filter comprises a sintered material.

Claim 18. A device according to claim 12 wherein said first filter comprises a material deposited by CVD.

Claim 21. A device according to claim 20 wherein said deep-bed filter is a loose-fill bed filter.

Claim 22. A device according to one of claims 12 to 21 wherein a filter selected from the group consisting of said first filter and said second filter are configured to be heated.

Claim 23. A device according to one of claims 12 to 21 wherein both said first and second filters are configured to be heated.

Claim 24. A method for filtering and adding a grain refining material to a metal melt, said method comprising:

filtering said melt using a porous medium as a first filter;

adding said grain-refining material to said melt after said filtering said melt using a porous medium; and

filtering said melt using a second filter after said adding,

wherein said second filter comprises a porous filter medium in the form of a deep-bed filter,

wherein said first filter is configured to operate based on cake filtration.